An Abſtract of a Letter *from Mr* J. Flamſteed. Math. Reg. *&* F. *of the* R.S. *giving the deſcription & uſes of an Inſtrument for finding the diſtances of* ♃^{s} *Satellits from his Axis, with the help of the Table of* Parallaxes *and Catalogue of* Eclipſes; *printed in the preceding* Tranſactions. *See* Tab. 2. Fig. 2.

THE little Circle in the middle repreſents the *Planet Jupiter*, the four concentrick Circles the proper Orbits of his four *Satellits*, duly proportioned to the breadth of his body; the diſtances betwixt the *parallel* lines interſecting them, being each equall to one of his Semidiameters.

The 4 divided Circles next without theſe, are diſtinguiſhed into ſo many parts as there are days and hours in each Satellits revolution; the Innermoſt of them ſerving for the firſt, or innermoſt Satellit; that next it, for the 2d, that next without this for the 3d, and the outermoſt for the 4th; above which is a ſmall divided Arch of 15 degrees.

By this with the aforementioned tables to find the diſtances of the Satellits from ♃^{s} *Axis* to a propoſed time.

1. In the Table of Parallaxes of the Orb, find the the Parallax to the time propoſed, and note whether it be to be *Added* or *Subſtracted*.

2. Extend the thrid from the center of the Inſtrument over the *Parallax* numbred in the ſmall Arch: it cuts off in the 4 divided Circles, ſo many hours as each *Satellit* ſpends in paſſing from the *Axis* of the ſhadow to the *Axis* of ♃ viewed from our Earth; theſe I call the *Simple Parallactick Intervalls*, which if the *Parallax* was to be added, are alſo *additionall*, if to be Subſtracted, *Subductive*.

3. To theſe *Parallactick Intervalls* add the times of half the duration of the *Eclips* of each *Satellit*, which for the 1st. may be aſſumed 1^{h}. 10′, for the 2^{d}. 1^{h}. 30″.

greater

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greater exactneſs being needleſs; but for the 3d, and 4th, when Eclipſed, (their Immerſions into the ſhadow and emerſion from it being commonly given in the Catalogue) take half the difference of theſe times at the next Eclipſe to the time propoſed, for the half duration, and add them to the *Simple Parallactick Intervalls*, ſo have you them *Augmented*. But note that this year *1686*, and ſo often as the 4th *Satellit* is not Eclipſed, (which is two years in every ſix) its Intervall needs no augmentation, the Catalogue ſhewing the very time when it paſſes the *Axis* of the ſhadow.

4. Find in the Catalogue the times of the Eclipſes of each *Satellit* next preceding the time propoſed, and when the 4th is not Eclipſed, of its paſſing the *Axis* of the ſhadow, to which, if the *Parallactick* Intervalls augmented were *Additionall, add them to,* if Subductive, *Subſtract them from*, each the time of its proper *Satellits* Eclipſe, ſo have you very near the Apparent *times, when each Satellit laſt paſt over the Axis of* ♃ viewed from our Earth.

5. Subtract each of the times thus got from the time propoſed: the Remainders are the *Intervalls of the Motion of each Satellit from* ♃^{s} *Axis.*

6. Extend the thred from the Center over each of theſe Intervalls of Motion numbered ſeverally in the divided Circles belonging each to its proper Satellit, where it cuts the proper Orbit of that Satellit, whoſe intervall was numbered in its peculiar Circle, it ſhews amongſt the parallells, how many ſemidiameters of ♃ that Satellit is diſtant from him, and on which ſide of him tis poſited.

Note further, that the thred as it lay extended over the *parallax* of the *Orb* numbered in the ſmall Arch, where it cut the ſeveral proper Orbits of each Satellit, ſhew'd amongſt the Parallells, how many Semidiameters of ♃ the center of the ſhadow was diſtant from the center of ♃ viewed from our Earth. And that if the Parallax of the Orb were additionall, the ſhadow lies on the right hand from ♃, if Subductive, on the left.

To explain theſe precepts, I ſhall give two brief examples. Let it be then propoſed to know how far each Satellit appears diſtant from ♃ on the 26th of December this preſent year 1685, at 16^{h}. 52′. p, m. when the 3^{d} Satellit falls into the Shadow; alſo on July the 16. 1686. at 10^{h}. 00′. p. m. when there is no Eclipſe.

Vide Tab. 2. Fig 3. 1685. *Dec.* 26^{d}. 16^{h}. 52′. p. m. the Parallax of the Orb is 9°. 20′. additional.

	1	2	3	4
Therefore.	d h ′	d h ′	d h ′	d h ′
The ſimple Parallactick Intervalls Add	1. 05	2. 10	4. 25.	10. 20
The half duration of the Eclipſes to be Added.	1. 10	1. 30.	1. 18.	
The Parallactick Intervalls Augmented	2. 15.	3. 40.	5. 43.	
Laſt Immerſions and ☍s in the Catalogue. Dec.	25. 09. 37.	25. 05. 47.	19. 12. 58.	10. 00. 30.
Times of laſt paſſing Jupiters Axis Dec.	25. 11. 52.	25. 09 27.	19. 18 .41.	10. 10. 50.
Subtracted from the time propoſed. Dec.	26. 16. 52.	26. 16. 52.	26. 16. 52.	26. 16. 52.
Leaves the Intervalls of Motion.	1. 05. 00.	1. 07. 25	6. 22. 11.	16 06. 02
Over which numbered in their peculiar circles, the thred being ſeverally layd, cuts the proper Orbit of each at their viſible diſtances from Jupiter.	5 Semid dext.	$6\frac{1}{2}$ Sin;	3. dext.	$4\frac{1}{2}$ dext.

Vide Tab. 2. Fig. 4.

Again, 1686. *July* the 16. 10^{h}. p. m. the Parallax of the Orb. is 10°. 46. ſubductive.

	1	2	3	4
Hence	d h ′	d h ′	d h ′	d h ′
The ſimple Parallactick Intervalls ſub.	1. 12.	2. 35.	5. 10.	12. 00.
Half duration of the Eclipſes add.	1. 10.	1, 30.		

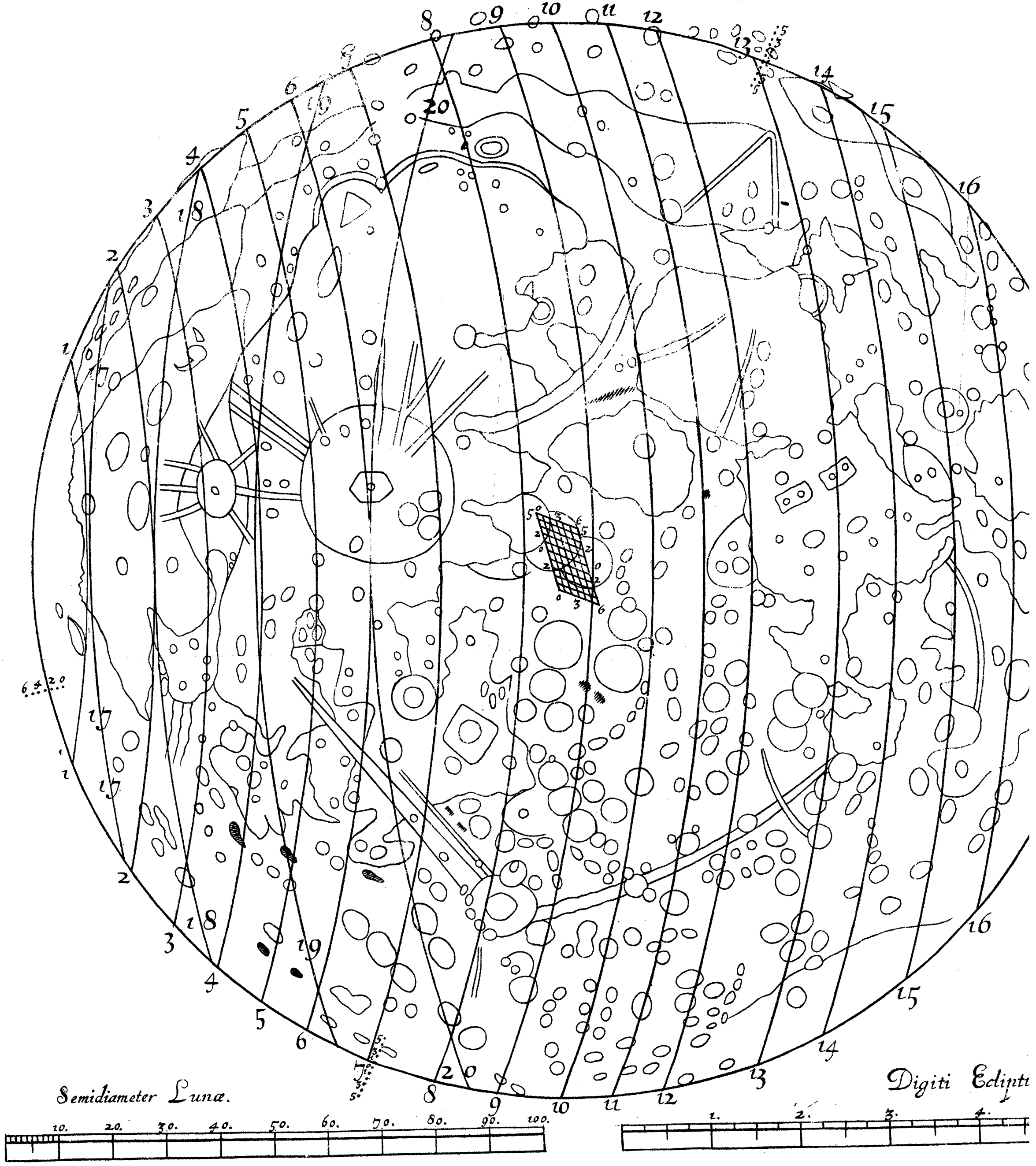
The Parallactick Intervalls Augmented.	2. 22.	4. 05.		
The next laſt Emerſions and paſſing the Axis of the ſhadow July.	15. 05. 55.	15. 22. 02.	15. 09. 19.	15. 17. 52.
Time of laſt paſſing the viſible Axis of Jupiter	15. 03. 33.	15. 17. 57.	15. 04. 09.	15. 05. 52
The time propoſed.	16. 10. 00.	16. 10. 00.	16. 10. 00.	16. 10. 00.
Intervals of Motion.	1. 06. 27.	0. 16. 03.	1. 0. 51.	1. 04. 08.
Therefore Diſtances from Jupiters Axis.	$5\frac{1}{2}$ Semid. dext.	$8\frac{1}{5}$ Siniſ.	$12\frac{1}{2}$ Sin.	$10\frac{1}{2}$. Sin.

And the Satellits ſtand at the two propoſed times as in the two Figures.

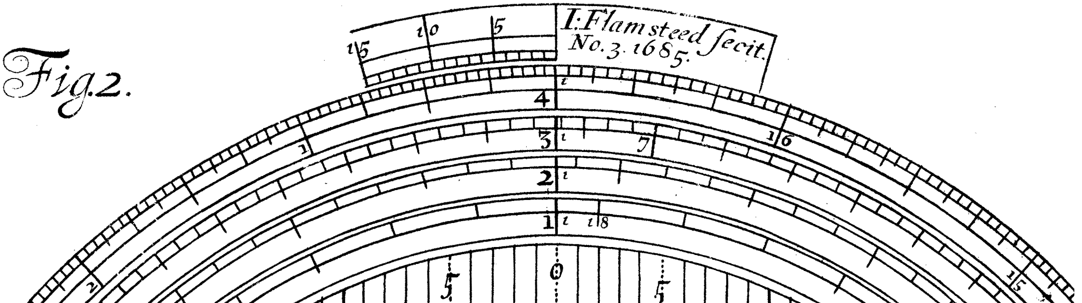
In drawing of which, tho' I have conſidered their Latitudes from the line of their utmoſt Elongations paſſing through ♃^{s} center, yet I give no rules for determining it, the contrivances and directions neceſſary on that account, being too many and troubleſome to be inſerted here: my deſign is only to ſhew the Ingenuous obſerver, how to find at what diſtance from ♃, each Satellit appears, that ſo he may not miſtake one for another when he is to obſerve any of their Eclipſes. But thus much I ſhall adviſe him, That from the beginning of the year 1686. for 3 years following, the Satellits, in the upper or remoter Semi-Circles of their Orbits from us, have South Latitude from the line of their utmoſt Elongations, paſſing over ♃^{s} center; in the under or nearer North, but continually decreaſing till the end of 3 years, when they change for the contrary. That the Latitude of the 4th Satellit is never more then $1\frac{1}{5}$ Semidiameter of ♃, of the 3^{d} little more then half as much, of the two innermoſt ſtill leſs. And that towards the end of the year, the 4th Satellit (which will then have paſſed uneclipſed near two years) will begin to fall into the *Penumbra* again, for which reaſon he may doe well to attend its tranſits at its firſt appearing, leaſt perhaps it be really Eclipſed.

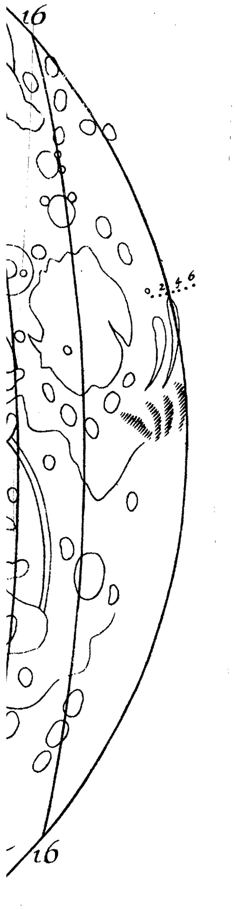
The Obſervatory, Novemb. 17. 1685.

Tab. 2. Fig. 1.



Tab.2. Fig.2.

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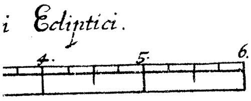
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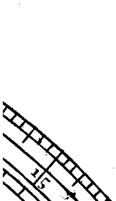
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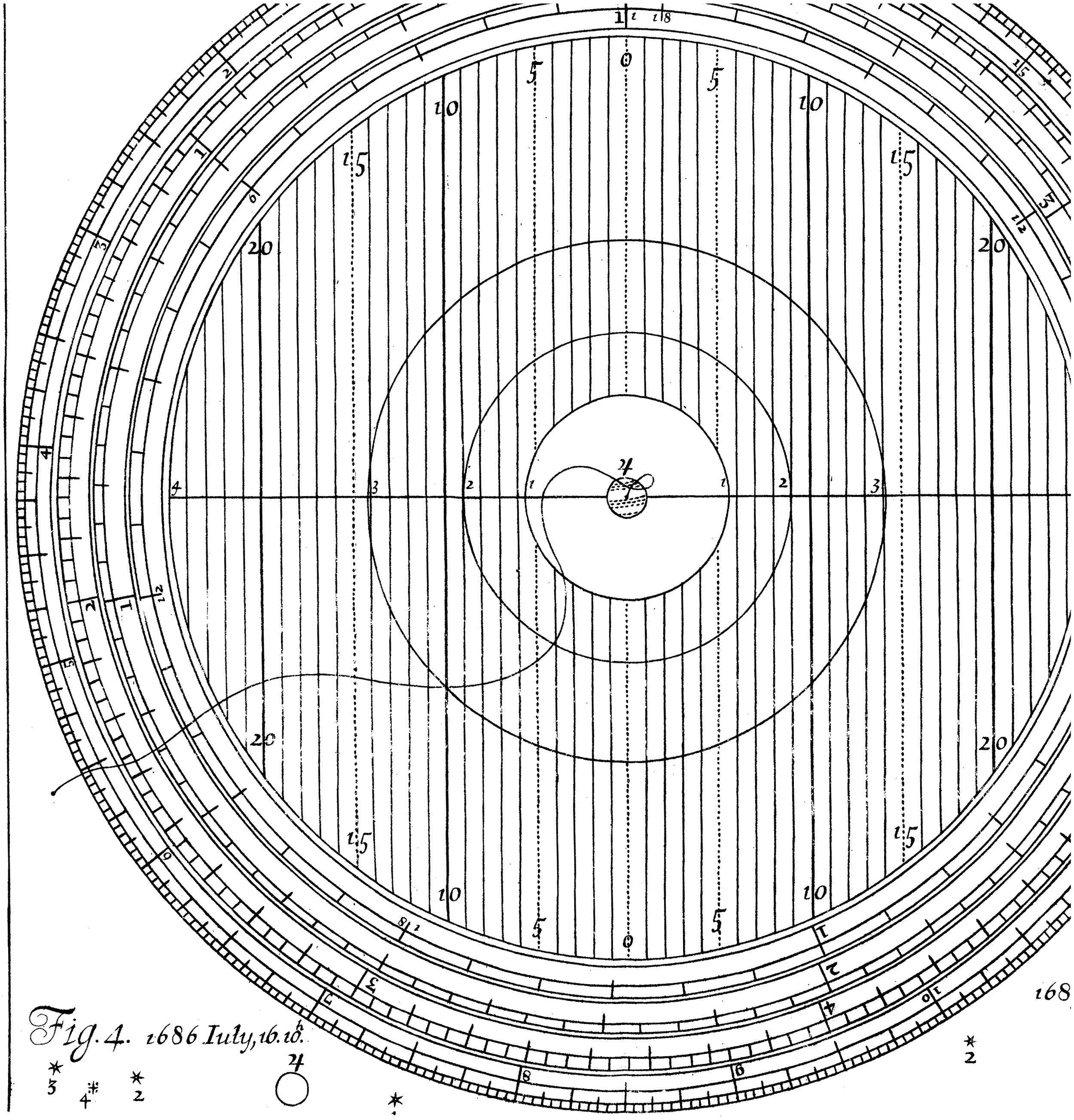


Fig. 4. 1686 July, 16.18.

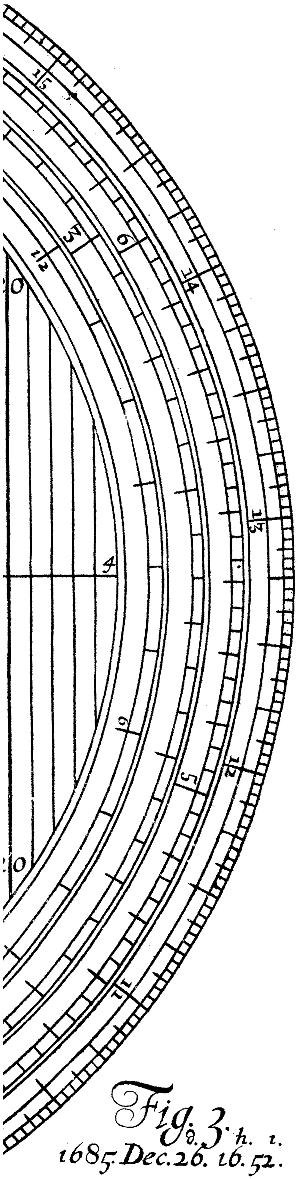
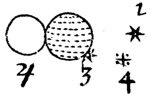


Fig. 3. d. h. ′.
1685. Dec. 26. 16. 52.



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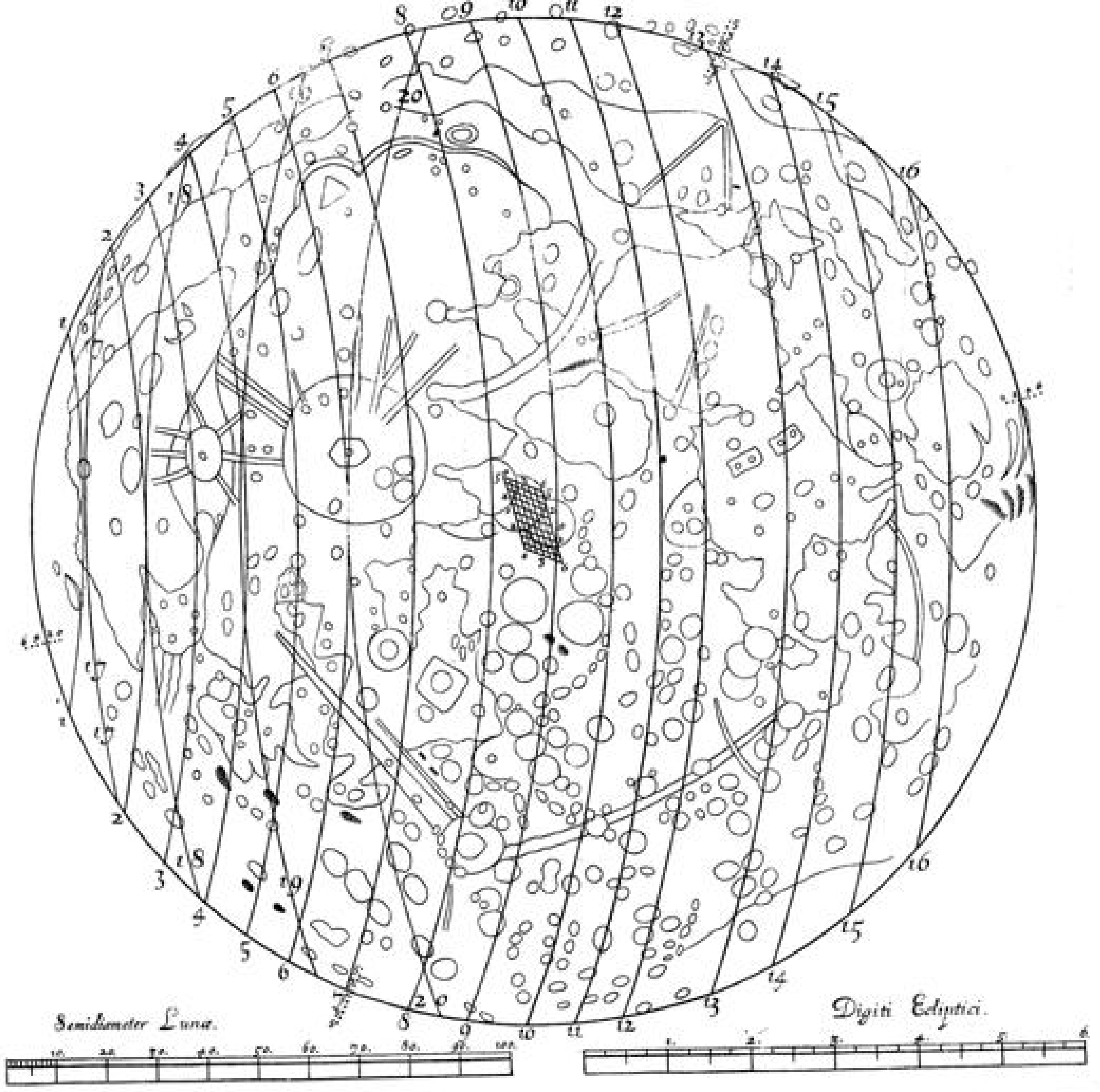

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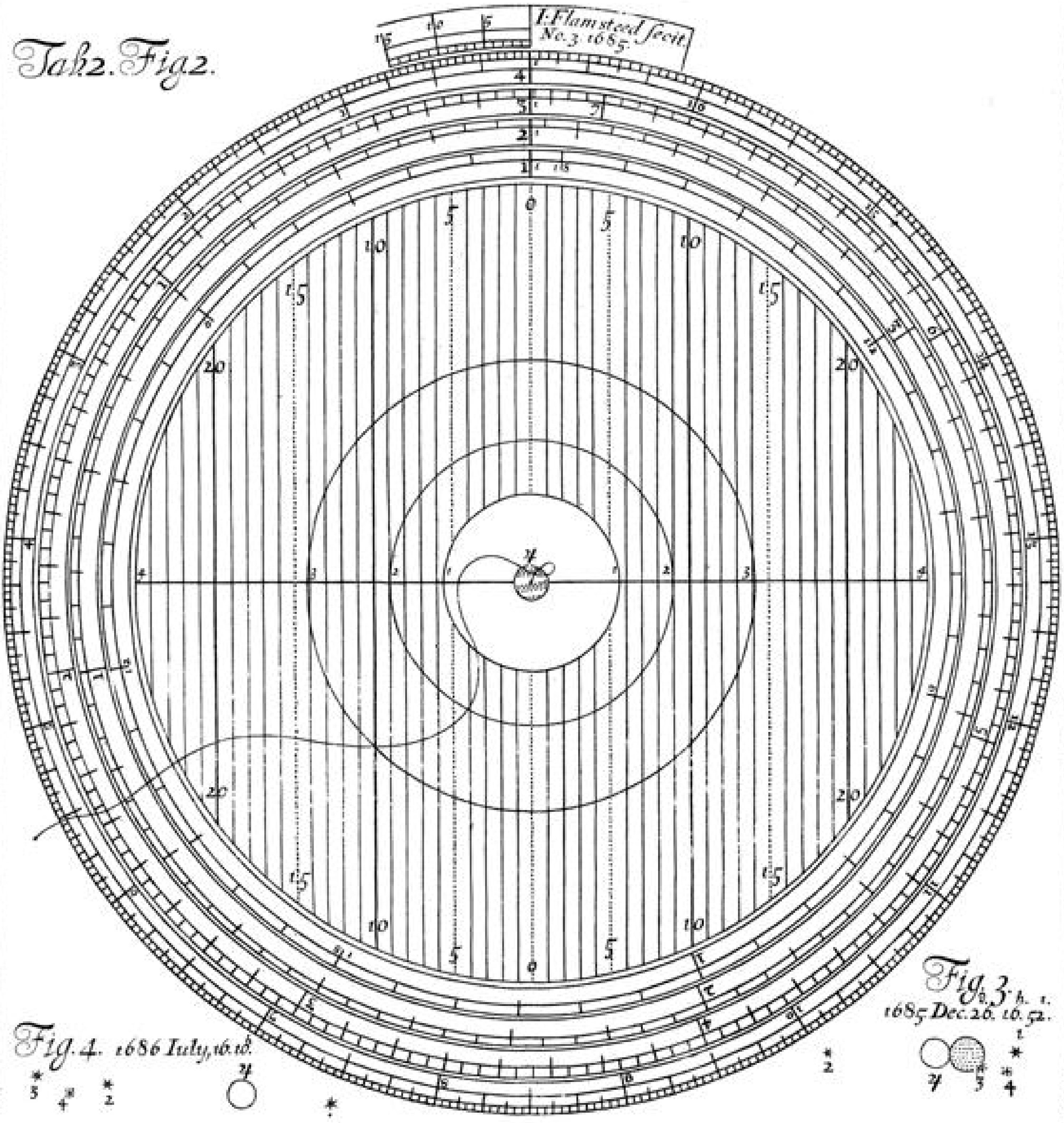
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Fig. 4. 1686 July, 16. 18.

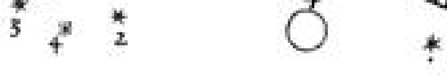

Fig. 3. h. 1.
1685 Dec. 26. 16. 52.